

In the Claims

Please amend the claims as follows:

1. (currently amended) A method for creating a model of inputs and outputs of integrated circuits, comprising the steps of:

representing in the model the output characteristics of integrated circuit driver circuits by two types of elements, switching and non-switching;

tabulating the output characteristics for each of the elements by applying a DC voltage source on the output of the driver circuits and measuring the current through each element;

characterizing the switching elements represented as voltage-time controlled resistors by obtaining the product of DC impedance as a function of voltage and scalars that are functions of time; and

embedding in the model equations that are functions of input edge arrival times and cycle time for each scalar in order to modify behavior of the switching and non-switching elements to fit their environment.

2. (currently amended) The method of claim 1 also comprising the step of :

accounting for variations in temperature and supply voltages in the integrated circuit, wherein the characteristics for the elements are obtained from a dc_base impedance according to the equation:

$$dc_impedance = (1 + D0) * dc_base$$
 where ~~D0~~ D0 is a function of supply voltage and temperature.

3. (currently amended) The method of claim 1 where the step of characterizing the switching elements ~~as voltage-time-controlled resistors~~ also comprises the step of: normalizing the resistor's transient impedance to the ~~dc~~ DC impedance to produce the scalars that are functions of time.

4. (currently amended) The method of claim 1 where the characterization of the switching elements ~~as of the voltage-time controlled resistors to produce to obtain a transient impedance,~~ includes using a time-varying scalar is started with a component measured from the time when midpoint of the an input transition reaches its midpoint value.
5. (original) The method of claim 1 also comprising the step of saving the scalars in a tabular format.
6. (currently amended) The method of claim 1 also comprising the step of ~~making waveforms generated by the switching elements periodic by using definitions of local times as function of periodic rising and falling input edge arrival times and controlling time through indexing equations~~ generating a periodic waveform from the switching elements by defining a local time as a function of the periodic rise and fall of an input edge arrival time and creating a unique time index with a series of equations, each equation corresponding to a rising or falling input transition.
7. (currently amended) The method of claim 1 also comprising the step of applying a series of indexing equations that incorporate a plurality of modulating parameters to account for variations in environmental conditions.
8. (original) The method of claim 7 wherein the environmental conditions are slew rate, temperature or supply voltage.
9. (original) The method of claim 1 where the switching elements reflect composite transient impedance behavior of a pull-up or pull-down network that are comprised of a plurality of FETs and parasitics.
10. (original) The method of claim 1 where the non-switching elements are an ESD device and a power clamp.

11. (currently amended) The method of claim 1 ~~where the method also comprising the steps of obtaining behavioral characteristics for a pre-drive current stage linked to the switching elements and a decoupling stage linked to the pre-drive current stage, switching elements, and non-switching elements; and applying them to the model~~ modeling a pre-drive current stage or a decoupling stage as any one of the following:

a fixed-value element

a non-switching element that is a function of parameters not varying in time or

a switching element that is a function of both time and non-time varying parameters.

12. (currently amended) A method for creating a model of inputs and outputs of integrated circuits, comprising the steps of:

representing in the model the output characteristics of integrated circuit driver circuits by two types of elements, switching and non-switching;

tabulating the output characteristics for each of the elements by applying a DC voltage source on the output of the driver circuits and measuring the current through each element;

characterizing the switching elements represented as voltage-time controlled resistors by obtaining the product of ~~de~~ DC conductance as a function of voltage and ~~a~~ scalars that are functions of time; and

embedding in the model equations that are functions of input edge arrival times and cycle time for each scalar in order to modify behavior of the switching and non-switching elements to fit their environment.

13. (currently amended) The method of claim 12 also comprising the step of :

accounting for variations in temperature and supply voltages in the integrated circuit, wherein the characteristics for the elements are obtained from a *dc_base* impedance according to the equation:

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$dc_conductance = (1+D0)*dc_base$, where ~~D0~~ D0 is a function of supply voltage and temperature.

14. (previously presented) The method of claim 12 where the step of characterizing the switching elements as a voltage time-controlled resistors also comprises the step of: normalizing the resistor's transient conductance to the DC conductance to produce the scalar that is a function of time.

15. (currently amended) The method of claim 12 where the characterization of the switching elements ~~as voltage time controlled resistors is obtained starting timing at a midpoint of the transition of the input signal of the driver to obtain a transient impedance, includes using a time-varying scalar component measured from the time when an input transition reaches its midpoint value.~~

16. (original) The method of claim 12 also comprising the step of saving the scalars in a tabular format.

17. (currently amended) The method of claim 12 also comprising the step of ~~making waveforms generated by the switching elements periodic by using definitions of local times as functions of periodic rising and falling input edge arrival times and controlling time through indexing equations~~ generating a periodic waveform from the switching elements by defining a local time as a function of the periodic rise and fall of an input edge arrival time and creating a unique time index with a series of equations, each equation corresponding to a rising or falling input transition.

18. (currently amended) The method of claim 12 also comprising the step of applying a series of indexing equations that incorporate a plurality of modulating parameters to account for variations in environmental conditions.

19. (previously presented) The method of claim 18 wherein the environmental conditions are slew rate, temperature or supply voltage.

20. (previously presented) The method of claim 12 where the switching elements reflect composite transient conductance behavior of a pull-up or pull-down network that are comprised of a plurality of FETs and parasitics.

21. (original) The method of claim 12 where the non-switching elements are an ESD device and a power clamp.

22. (currently amended) The method of claim 12 ~~where the method~~ also comprising the steps of obtaining behavioral characteristics for a pre-drive current stage linked to the switching elements and a decoupling stage linked to the pre-drive stage, switching and non-switching elements; and applying them to the model.

23. (cancelled)

24. (currently amended) The ~~circuit~~ method of claim ~~24~~ 12 which also comprises coupling a pre-drive stage ~~coupled~~ to the switching elements and connecting a decoupling stage ~~tie~~ to the switching and non-switching elements and the pre-drive stage.

25. (currently amended) The ~~circuit~~ method of claim ~~24~~ 12 wherein a fixed value element is used to represent the pre-drive or decoupling stage.

26. (currently amended) The ~~circuit~~ method of claim ~~24~~ 12 wherein a non-switching element that is a function of parameters that do not vary in time is used to represent the pre-drive or decoupling stage.

27. (currently amended) The ~~circuit~~ method of claim ~~24~~ 12 wherein a switching element which is a function of both time and non-time varying parameters is used to represent the pre-drive or decoupling stage.

28. (currently amended) A method for creating a model of inputs and outputs of integrated circuits, comprising the steps of:

representing in the model the output characteristics of integrated circuit driver circuits by two types of elements, switching and non-switching;

tabulating the output characteristics for each of the elements by applying a DC voltage source on the output of the driver circuits and measuring the current through each element;

characterizing the switching elements represented as voltage-time controlled resistors by obtaining the product of DC conductance or impedance as a function of voltage and scalars that are functions of time;

accounting for variations in input slew rate, temperature, and supply voltages and their affects effects on the elements by using a modified local time;

accounting for variations in temperature and supply voltages in the integrated, wherein the characteristics for the elements are obtained from a dc_base impedance, according to the equation:
$$\text{dc_impedance or conductance} = (1 + D0) * \text{dc_base}, \text{ where } D0 \text{ is a function of supply voltage and temperature; and}$$

embedding in the model equations that are functions of input edge arrival times and cycle time for each scalar in order to modify behavior of the switching and non-switching elements to fit their environment..

29. (canceled) A method for creating a model of inputs and outputs integrated circuits, comprising the steps of:

representing in the model the output characteristics of integrated circuit driver circuits by two types of elements, switching and non-switching;

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tabulating the output characteristics for each of the elements by applying a DC voltage source on the output of the driver and measuring the current through each element;

representing in the model switching elements as voltage-time controlled resistors by obtaining the product of DC conductance or impedance as a function of voltage and scalars that are functions of time;

accounting for variations in input slew rate, temperature, and supply voltages and their ~~affects~~ effects on the elements by using a modified local time;

accounting for variations in temperature and supply voltages, wherein device DC characteristics are obtained from a *dc_base*, according to the equation: $dc_impedance \text{ or } conductance = (1+D0)*dc_base$, where ~~D0~~ D0 is a function of supply voltage and temperature; and

embedding in the model equations that are functions of input edge arrival times and cycle time for each scalar in order to modify behavior of the switching and non-switching elements to fit their environment.

30. (previously presented) A program storage device readable by a machine, tangibly embodying a program of instruction executable by a machine, to perform method steps for creating a model of inputs and outputs of integrated circuits, the method comprising the steps of:

representing in the model the output characteristics of integrated circuit driver circuits by two types of elements, switching and non-switching;

tabulating the output characteristics for each of the elements by applying a DC voltage source on the output of the driver circuits and measuring the current through each element;

characterizing the switching elements as voltage-time controlled resistors by obtaining the product of either DC impedance or conductance as a function of voltage and scalars that are functions of time; and

embedding in the model equations that are functions of input edge arrival times and cycle time for each scalar in order to modify behavior of the switching and non-switching elements to fit their environment.

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